

What is claimed is:

1. An integrated circuit package capable of operating in multiple orientations, comprising:
 - a plurality of contact elements extending from a lower surface of the integrated circuit package, wherein the contact elements are arranged symmetrically thereon for enabling the integrated circuit package to be inserted on a circuit board in at least two discrete orientations;
 - at least two orientation contact elements arranged such that, upon integrated circuit package power up, the orientation contact elements transmit orientation signals indicative of the integrated circuit packages insertion orientation in the circuit board; and
 - a plurality of multiplexer devices operatively connected to the contact elements and functional circuitry of the integrated circuit package, wherein the multiplexer devices route signals between the contact elements and functional circuitry in response to the orientation signals from the orientation contact elements.
2. The integrated circuit package of claim 1, wherein the orientation signals are based upon circuit board voltage levels during power up of the integrated circuit package.
3. The integrated circuit package of claim 1, further comprising:
 - a plurality of power supply contact elements for transmitting power to the integrated circuit package from the circuit board, wherein the power supply contact elements are arranged symmetrically on the integrated circuit package for enabling power

transmission upon integrated circuit package insertion in any of the at least two discrete orientations.

4. The integrated circuit package of claim 3, further comprising:

a plurality of ground contact elements for providing a ground connection to the integrated circuit package, wherein the ground contact elements are arranged symmetrically on the integrated circuit package for enabling power transmission upon integrated circuit package insertion in any of the at least two discrete orientations.

5. The integrated circuit package of claim 1, further comprising:

an encoder device for receiving the orientation signals from the orientation contact elements and generating at least one orientation code signal representative of the orientation of the integrated circuit package within the circuit board,

wherein the multiplexer devices route signals between the contact elements and functional circuitry in response to the at least one orientation code signal from the encoder device.

6. The integrated circuit package of claim 5, wherein the at least two discrete orientations comprise four discrete orientations, wherein each contact element may be inserted into exactly four discrete locations in the circuit board and wherein each circuit board location may have exactly four contact elements inserted therein.

7. The integrated circuit package of claim 6, further comprising:

four orientation contact elements for transmitting four orientation signals

representative of the integrated circuit insertion orientation; and

the encoder device comprising a four to two encoder device for generating two orientation code signals in response to four orientation signals.

8. The integrated circuit package of claim 7, wherein the plurality of multiplexer devices further comprise:

a plurality of four to one multiplexer devices for generating an output signal corresponding to one of the four contact elements capable of being inserted into the same location in the circuit board based upon the two orientation code signals from the four to two encoder device indicative of the integrated circuit insertion orientation in the circuit board.

9. The integrated circuit package of claim 7, wherein the plurality of multiplexer devices further comprise:

a plurality of four to one multiplexer devices for generating an output signal corresponding to one of the four locations in the circuit board capable of receiving a signal from the same contact element based upon the two orientation code signals from the four to two encoder device indicative of the integrated circuit insertion orientation in the circuit board.

10. The integrated circuit package of claim 7, wherein the four orientation signals are based upon circuit board voltage levels during power up of the integrated circuit.

11. The integrated circuit package of claim 10, wherein three orientation signals are

pulled high from the circuit board and one orientation signal is pulled low from the circuit board.

12. The integrated circuit package of claim 1, wherein the integrated circuit package is a ball grid array type integrated circuit package wherein the contact elements comprise balls.

13. The integrated circuit package of claim 1, wherein the integrated circuit package is a pin grid array type integrated circuit package wherein the contact elements comprise pins.

14. A method for configuring an integrated circuit package capable of operating in multiple orientations, comprising the steps of:

arranging a plurality of contact elements on a lower surface of the integrated circuit package, wherein the contact elements are arranged symmetrically thereon for enabling the integrated circuit package to be inserted on a circuit board in at least two discrete orientations;

arranging at least two orientation contact elements on the integrated circuit package such that, upon integrated circuit package power up, the orientation contact elements transmit orientation signals indicative of the integrated circuit packages insertion orientation in the circuit board; and

operatively connecting a plurality of multiplexer devices to the contact elements and functional circuitry of the integrated circuit package, for routing signals between the

contact elements and functional circuitry in response to the orientation signals from the orientation contact elements.

15. The method of claim 16, further comprising the step of basing the orientation signals upon circuit board voltage levels during power up of the integrated circuit package.

16. The method of claim 14, further comprising the step of:

symmetrically arranging a plurality of power supply contact elements on the integrated circuit package for transmitting power to the integrated circuit package from the circuit board upon integrated circuit package insertion in any of the at least two discrete orientations.

17. The method of claim 16, further comprising the step of:

symmetrically arranging a plurality of ground contact elements on the integrated circuit package for providing a ground connection to the integrated circuit package upon integrated circuit package insertion in any of the at least two discrete orientations.

18. The method of claim 14, further comprising the steps of:

operatively connecting an encoder device to the at least two orientation contact elements for receiving the orientation signals therefrom and generating at least one orientation code signal representative of the orientation of the integrated circuit package within the circuit board; and

operatively connecting the multiplexer devices for routing signals between the

contact elements and functional circuitry in response to the at least one orientation code signal from the encoder device.

19. The method of claim 18, wherein the at least two discrete orientations comprise four discrete orientations, wherein each contact element may be inserted into exactly four discrete locations in the circuit board, and wherein each circuit board location may have exactly four contact elements inserted therein.

20. The method of claim 19, further comprising the steps of:

arranging four orientation contact elements on the integrated circuit package for transmitting four orientation signals representative of the integrated circuit insertion orientation; and

operatively connecting a four to two encoder device to the integrated circuit package for generating two orientation code signals in response to four orientation signals.

21. The method of claim 20, further comprising the step of:

operatively connection a plurality of four to one multiplexer devices to the integrated circuit device, each four to one multiplexer device generating an output signal corresponding to one of the four contact elements capable of being inserted into the same location in the circuit board based upon the two orientation code signals from the four to two encoder device indicative of the integrated circuit insertion orientation in the circuit board.

22. The method of claim 20, further comprising the step of:
operative connecting a plurality of four to one multiplexer devices to the integrated circuit package, each four to one multiplexer device generating an output signal corresponding to one of the four locations in the circuit board capable of receiving a signal from the same contact element based upon the two orientation code signals from the four to two encoder device indicative of the integrated circuit insertion orientation in the circuit board.
23. The method of claim 20, further comprising the step of basing the four orientation signals upon circuit board voltage levels during power up of the integrated circuit.
24. The method of claim 23, further comprising the steps of:
basing three orientation signals on high voltages pulled from the circuit board;
and
basing one orientation signal on a low voltage pulled from the circuit board.
25. The method of claim 14, wherein the integrated circuit package is a ball grid array type integrated circuit package wherein the contact elements comprise balls.
26. The method of claim 14, wherein the integrated circuit package is a pin grid array type integrated circuit package wherein the contact elements comprise pins.